

59. (New) The method of claim 39, wherein the film is deposited using gaseous materials selected from the group consisting of  $\text{SiH}_4$ ,  $\text{H}_2$ ,  $\text{N}_2$ ,  $\text{NH}_3$ ,  $\text{PH}_3$ ,  $\text{CH}_4$ ,  $\text{Si}_2\text{H}_6$  and  $\text{O}_2$ .

60. (New) The method of claim 39, wherein the film is a metallic film or a silicon film.

61. (New) The method of claim 39, wherein the film forms part of a dielectric layer, a semiconductor layer or a metal layer.

### REMARKS

The Examiner has renumbered original claims 20-25 as claims 19-24, because claim 19 was skipped over in the originally filed claims. As such, the pending claims prior to this response are claims 1-24. Claim 12 stands rejected under 35 U.S.C. §112, first paragraph, for lack of an enabling description in the specification. Claims 14-20 stand rejected under 35 U.S.C. §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Claims 14-18, 20-22 and 24 stand rejected as anticipated by U.S. Patent No. 6,451,390 to Goto et al. under 35 U.S.C §102(e). Additionally, claims 14-18, 20-22 and 24 stand rejected as anticipated by U.S. Patent No. 6,427,623 to Ko et al. under 35 U.S.C §102(e). Claims 1-24 stand rejected as obvious over U.S. Patent No. 6,143,666 to Lin et al. in view of U.S. Patent No. 6,352,594 to Cook et al., 2002 IEEE/SEMI Advanced Semiconductor Manufacturing Conference article by Ekbundit et al., IEEE Transactions on Semiconductor Manufacturing, vol 12, no. 3, 340, article by Lee et al., U.S. Patent No. 5,098,865 to Machado et al., and U.S. Patent No. 6,225,601 to Beer et al. Claims 1-13 and 25-61 are pending in the instant application.

### *Drawings*

Applicants have amended Figure 2A to correct an inadvertent drafting error in one of the lead lines. No new matter has been added by this amendment.

### *Amendments to the Specification*

Applicants have amended several paragraphs in the specification to correct typographical errors. No new matter has been added by these amendments.

### *Amendments to the Claims and New Claims*

Claims 1-7 have been amended to correct inadvertent typographical errors and to more particularly recite certain aspects of Applicants' invention. Claims 2 and 7 have also been amended to provide the correct antecedent basis. Amended claims 1-7 are supported at least by original claims 1-7, respectively. Claim 10 has been amended to more particularly recite certain aspects of Applicants' invention. The amendment to claim 10 is supported at least by original claim 10, and paragraphs 2, 16, 35 and 36 of the specification. Claim 12 has been amended to correct inadvertent typographical errors. No new matter has been added by these amendments.

Applicants have added new claims 25-61 in order to more particularly recite certain aspects of Applicants' invention. These new claims are not taught or suggested by the cited prior art references. No new matter has been added by these new claims.

### *35 U.S.C. §112, First Paragraph Rejection*

The Examiner has rejected claim 12 under 35 U.S.C. §112, First Paragraph, for lack of an enabling description in the specification. In particular, the Examiner has rejected claim 12 because, allegedly, neither the claim nor the specification indicate the concentration of the TEOS to be deposited. Applicants respectfully traverse the rejection of claim 12, because the concentration of TEOS is not, in fact, required to enable the claimed invention. One skilled in the art would know that the standard concentration of TEOS in the claimed method is 100%. This is especially true as the TEOS liquid is not generally mixed with any other liquids in the art. While it is possible to practice the invention with TEOS concentrations at less than 100%, that would be the exception to the general practice in the art. Applicants assert that the specification of the TEOS flow rate is sufficient to practice the invention described in claim 12. In other words, in the art, concentrations of volatiles that are used in deposition processes are specified using glass flow rates, not concentrations. The specification provides a number of TEOS flow rate examples (See, for example, paragraph 54

of the specification as filed). Respectfully, Applicants request that the Examiner reconsider and withdraw the rejection to claim 12.

New claim 29 also claims the TEOS flow rate without a TEOS concentration. The same arguments for claim 12 should apply equally to claim 29 on this issue. Thus, claim 29 is allowable under 35 U.S.C. §112, first paragraph.

#### *35 U.S.C. §112, Second Paragraph Rejection*

The Examiner has rejected claims 14-20 under 35 U.S.C. §112, Second Paragraph, for indefiniteness for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the term “substantially uniform thin” allegedly is not defined by the claims or the specification.

Applicants have canceled claims 14-20, and therefore the rejection is moot. Applicants have canceled claims 14-20 in order to place this application in condition for allowance. Applicants do not agree with, nor do they acquiesce in, the 35 U.S.C. §112 rejection of these claims made in the office action mailed on November 6, 2002. These cancellations are not made for reasons of patentability. Applicants therefore reserve the right to prosecute these canceled claims separately in one or more continuing or divisional applications in the future.

#### 35 U.S.C. §102 Rejections

The Examiner has rejected claims 14-18, 20-22 and 24 under 35 U.S.C. §102(e) as being anticipated by Goto, and as being separately anticipated by Ko. Applicants have canceled claims 14-18, 20-22 and 24 in order to place this application in condition for allowance. Thus, the rejection is moot. Applicants do not agree with, nor do they acquiesce in, the 35 U.S.C. §102 rejection of these claims stated in the office action mailed on November 6, 2002. These cancellations are not made for reasons of patentability. Applicants therefore reserve the right to prosecute these canceled claims separately in one or more continuing or divisional applications in the future.

#### 35 U.S.C. §103 Rejections

The Examiner has rejected claims 1-24 under 35 U.S.C. §103(a) as being unpatentable

over the combined teachings of Lin, Cook, Ekbundit, Lee, Machado and Beer. Applicants have canceled claims 14-24, so the rejection as it is applied to claims 14-24 is moot. Applicants do not agree with, nor do they acquiesce in, the 35 U.S.C. §103 rejection of claims 14-24 stated in the office action mailed on November 6, 2002. These cancellations are not made for reasons of patentability. Applicants therefore reserve the right to prosecute these canceled claims separately in one or more continuing or divisional applications in the future.

Applicants respectfully traverse the 35 U.S.C. §103 rejection of claims 1-13 as obvious over Lin in view of Cook, Ekbundit, Lee, Machado and Beers.

Claim 1 as amended recites in pertinent part:

controlling a temperature of at least two distinct locations on the large substrate to include a perimeter area of a surface of the large substrate and an area of the surface inside of the perimeter area; and

maintaining the temperature of the perimeter area of the surface of the large substrate within a range between about 10°C less than the temperature of the area of the surface inside of the perimeter area to about 20°C higher than the temperature of the area of the surface inside of the perimeter area.

Lin discloses a plasma surface treatment method utilizing TEOS to form a silicon dielectric layer on a substrate. As correctly noted by the Examiner, Lin does not teach or suggest a method of controlling the temperature of the perimeter and inside surface of a substrate within the claimed temperature ranges. Lin also does not teach or suggest depositing a film having a uniformity of less than or equal to about 10%.

Cook is focused mainly on a gas injection and exhaust system for use in chemical vapor deposition reactors. While Cook notes that various parameters (i.e. pressure, temperature, gas composition, etc.) may be controlled to produce more uniform film deposition (See, e.g., column 1, lines 21-25), it does not teach or suggest a method of controlling the temperature at two distinct locations on a substrate within the claimed ranges. Cook also does not teach or suggest that the deposited film has a uniformity of less than or equal to about 10%.

Ekbundit, Lee and Machado discuss the idea that film thickness in a deposition

process depends on temperature, but they do not teach or suggest the claimed invention. Specifically, they do not suggest controlling the temperature on a substrate at two distinct locations on its surface within the claimed ranges, nor do they teach or suggest that the deposited film has a uniformity of less than or equal to about 10%. Further, Ekbundit teaches away from combining it with the other references, as Ekbundit teaches that film uniformity is influenced more by TEOS decomposition kinetics than by substrate temperatures (See, e.g., Ekbundit's Abstract). Thus, it discloses a different mechanism for film thickness control. Lee utilizes silicon rings to form a patterned susceptor to control film growth and thickness in a rapid thermal processing system (See, e.g., Lee's Abstract and Introduction). Thus, Lee also teaches a different mechanism for controlling film thickness. Machado teaches a basic plasma enhanced deposition process for forming high step coverage silicon dioxide films. While it mentions temperature as one factor in the process, it does not teach or suggest controlling the substrate temperature at two distinct locations within claimed ranges.

Thus, neither Lin, nor Cook, nor Ekbundit, nor Lee, nor Machado, nor any combination of these references teaches or suggests the elements of claim 1 recited above.

Beer discloses a method of heating a substrate support using two heating elements, wherein the temperatures of the two heating elements are raised at a predetermined heating rate utilizing a rapid heating technique. However, Beer focuses primarily on maintaining the difference between the temperatures of the two heating elements within a predetermined value in order to limit deformation and breakage of the substrate support (See, e.g., column 3, lines 24-30).

Thus, the cited references fail to teach or suggest each element of claim 1. For this reason, claim 1 is patentable over the cited art. Claims 2-13 ultimately depend from claim 1. Thus, claims 2-13 are patentable over the cited art for at least the same reasons that claim 1 is patentable over the cited art. For these reasons, Applicants respectfully request that the 35 U.S.C. §103 rejection, as it is applied to claims 1-13, be withdrawn.

### **35 U.S.C. §103(c)**

As noted above, Lin, Cook, Ekbundit, Lee and Machado do not teach or suggest all of the elements of any of claims 1-13. Beer cannot be used to remedy this deficiency because Applicants respectfully submit that, under 35 U.S.C. §103(c), Beer is disqualified as prior art

against the claimed invention. The instant application was filed after November 29, 1999, and at the time the invention was made, Beer and the claimed invention were owned by the same person or subject to an obligation of assignment to the same person. The Beer patent is assigned to Applied Komatsu Technology, Inc., which at the time of the invention was wholly owned by the assignee in the present application, Applied Materials, Inc. Since the Beer Patent issued on May 1, 2001, less than four months before the present application was filed, the Beer patent is a reference under 35 U.S.C. §102(e) and not under 35 U.S.C. §102(a)-(d). Thus, under 35 U.S.C. §103(c) and MPEP 706.02(k), Beer is disqualified as prior art against the claimed invention. Since the prior art, either alone or in combination, must teach or suggest each and every limitation of the rejected claims (See MPEP 706.02(j) and 2143.03), and since without Beer the other five references fail to teach every limitation, the references cited by the PTO are not sufficient to establish obviousness against claims 1-24.


Further, applicants disagree with the Examiner's stated motivation to combine the six references cited in the 35 U.S.C. §103 rejection of claims 1-24. As noted above, several references teach away from a method of controlling substrate temperatures in two distinct locations on the substrate within the claimed ranges. Further, while all of the references may acknowledge the influence of temperature on film deposition, only Beer teaches anything of controlling the temperature at the substrate using two or more heating elements and controls. Beer focuses on the rate of temperature increase in the two elements as it impacts the deformation of a substrate support, not specifically on the growth rate of the film as a function of the temperatures of two distinct locations on the substrate as in the claimed invention.

In view of the foregoing, Applicants believe that all of the claims are now in condition for allowance and respectfully request the Examiner to pass the subject application to issue. If for any reason the Examiner believes any of the claims are not in condition for allowance, he is encouraged to phone the undersigned at (650) 849-7777 so that any remaining issues may be resolved.

Aside from the filing fee for the additional claims, no fee is believed due for filing this response. However, if a fee is due, please charge such fee to Pennie & Edmonds LLP's Deposit Account No. 16-1150.

Respectfully submitted,


Date February 6, 2003

  
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